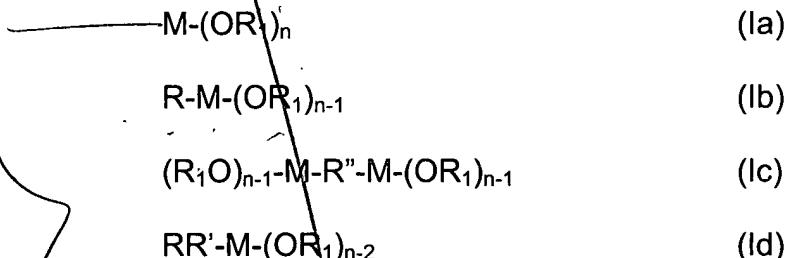


WHAT IS CLAIMED IS:

1. A method of protecting and/or strengthening a keratin material comprising applying to said keratin material an effective amount of a composition comprising at least one organometallic compound obtained from at least one metallic precursor chosen from:

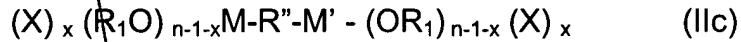
(a) at least one metal alkoxide chosen from formulae (Ia), (Ib), (Ic), and (Id) below:



wherein:

- M and M', which may be identical or different, denote a metal atom chosen from the transition metals of groups Ib to VIIb of the Periodic Table, group VIII of the Periodic Table, the lanthanide group of the Periodic Table, aluminum, silicon, boron, tin, magnesium, alkali metals and alkaline-earth metals;
- n denotes the valency of the metal;
- R<sub>1</sub>, which may be identical or different, is chosen from linear and branched, saturated and unsaturated hydrocarbon-based radicals containing 1 to 30 carbon atoms,
- R and R', which may be identical or different, are chosen from hydrogen, linear, branched and cyclic, saturated and unsaturated, C<sub>1-30</sub> hydrocarbon-based radicals, and a cosmetically active group; and
- R'' is chosen from -O-, -NR<sup>2</sup>-, -S-, linear, cyclic and branched, saturated and unsaturated, C<sub>1-30</sub> divalent hydrocarbon-based radicals, and a cosmetically active group, wherein R<sup>2</sup> is chosen from linear, cyclic and branched, saturated and unsaturated C<sub>1-30</sub> hydrocarbon-based radicals;

(b) at least one complex chosen from formulae (IIa), (IIb), (IIc) and (IId) below:



wherein:

- M, M', n, R, R', R" and R<sub>1</sub> have the same meaning as above;

- X is a ligand comprising an atom chosen from nitrogen, phosphorus, sulphur and oxygen;

and

- x is the number of atoms which may link to the central metal atom;

(c) at least one metal halide chosen from formulae (IIIa), (IIIb), (IIIc) and (IIId) below:

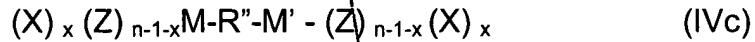


wherein:

- M, M', n, R, R' and R" have the same meaning as above; and

- Z, which may be identical or different, is chosen from a halogen atom; and

(d) at least one complexes chosen from formulae (IVa), (IVb), (IVc) and (IVd) below:



wherein:

- M, M', n, R, R', R'', X, x and Z have the same meaning as above; and  
wherein said cosmetically active group is chosen from a colorant group; a  
photochromic group; a group for screening out UV-A and/or UV-B radiation; a group for  
promoting adhesion to keratin materials, such as an amide, urethane, urea, hydroxyl,  
carboxyl, amino acid or polypeptide group; a group which facilitates make-up removal; a  
bacterial or bacteriostatic group; a chelating group, for example, one which can complex  
multivalent cations; a hydroxy acid; a group for preventing hair loss; an antioxidant group; a  
free-radical-scavenging group; and a vitamin-bearing group.

2. A method according to Claim 1, wherein said at least one organometallic  
compound is obtained by at least one of partial and total hydrolysis of said at least one  
metallic precursor and partial and total condensation of said at least one metallic precursor.

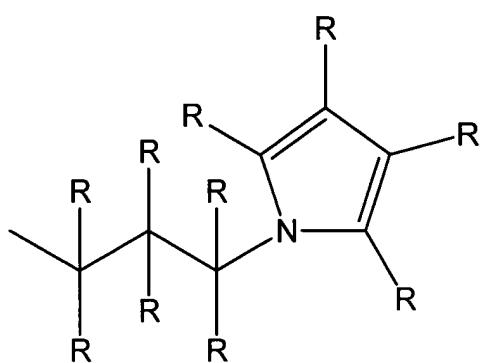
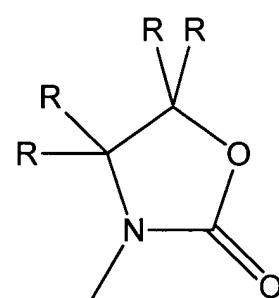
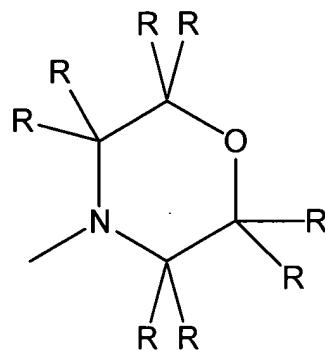
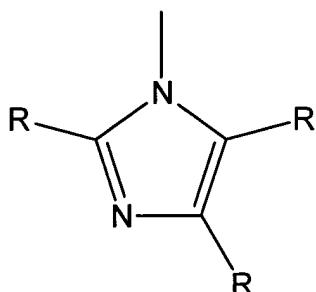
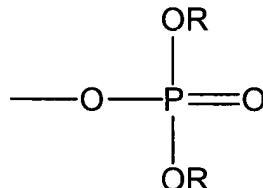
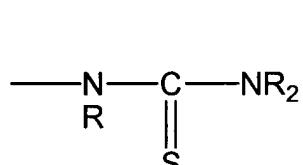
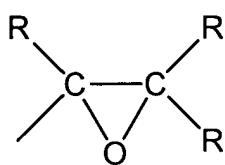
3. A method according to Claim 1, wherein R<sub>1</sub> is chosen from linear and  
branched, saturated and unsaturated hydrocarbon-based radicals containing 1 to 6 carbon  
atoms, optionally interrupted by and/or substituted with 1-20 hetero atoms chosen from O,  
N, S and P.

4. A method according to Claim 1, wherein R and R', which may be identical or  
different, are chosen from hydrogen, linear, branched and cyclic, saturated and unsaturated  
C<sub>2-20</sub> hydrocarbon-based radicals, optionally substituted and/or interrupted with 1-20 hetero  
atoms chosen from O, N, S and P.

5. A method according to Claim 1, wherein R'' is chosen from linear, cyclic and  
branched, saturated and unsaturated, C<sub>2-20</sub> divalent hydrocarbon-based radicals, optionally  
interrupted and/or substituted with 1-20 hetero atoms chosen from O, N, P and/or S.,

6. A method according to Claim 1, wherein R<sup>2</sup> is chosen from linear, cyclic and branched, saturated and unsaturated C<sub>2-20</sub> hydrocarbon-based radicals.

7. A method according to Claim 1, wherein at least one of R, R', and R'', which may be identical or different, are substituted with at least one substituent chosen from a halogen atom, -NR<sub>2</sub>, -CO-NR<sub>2</sub>, -SR, -R-S-R, -CO<sub>2</sub>R, -COR, -OH, -N=C=O, -NR-CO-NR<sub>2</sub>, -N<sup>+</sup>R<sub>3</sub>, -S<sup>+</sup>=C (NR<sub>2</sub>)<sub>2</sub>; sulphonate (-SO<sub>3</sub>R) ;



wherein R, which may be identical or different, are chosen from hydrogen and linear, branched and cyclic, saturated and unsaturated, C<sub>1-30</sub> hydrocarbon-based radicals.

8. A method according to Claim 1, wherein said ligand optionally bears at least one cosmetically active group.

9. A method according to Claim 1, wherein Z is chosen from chlorine, iodine, bromine and fluorine.

10. A method according to Claim 1, wherein said amount is effective to at least one of quickly and durably improve the rigidity of said keratin material and quickly and durably improve cohesion of said keratin material.

11. A method according to Claim 10, wherein said amount is effective to quickly and durably improve the rigidity of said keratin material.

12. A method according to Claim 10, wherein said amount is effective to quickly and durably improve the cohesion of said keratin material.

13. A method according to Claim 10, wherein said amount is effective to quickly and durably improve the rigidity and the cohesion of said keratin material.

14. A method according to Claim 1, wherein said keratin material is chosen from the toenails, the fingernails, the eyelashes, the eyebrows, body hair and head hair.

15. A method according to Claim 1, wherein said amount is effective to reduce the brittleness of the nails.

16. A method according to Claim 15, wherein said amount is effective to obtain harder, stronger and less brittle nails, nails which no longer split, or nails which no longer crack.

*Sub  
a2  
Conc*

17. A method according to Claim 15, wherein said amount is effective to reduce the brittleness of weakened nails.

18. A method according to Claim 17, wherein said amount is effective to reduce the brittleness of weakened nails chosen from striated nails, cracked nails, soft nails, supple nails, and nails which have a tendency to split.

19. A method according to Claim 1, wherein said amount is effective to rigidify the hair.

20. A method according to Claim 19, wherein said amount is effective to improve the styling of said hair.

21. A method according to Claim 19, wherein said hair is soft hair.

22. A method according to Claim 1, wherein said at least one metallic precursor is chosen from at least one compound of formulae (Ia), (Ib), and (IIa).

23. A method according to Claim 1, wherein said metal atom M is chosen from titanium, zirconium, aluminum, iron, tin, and silicon.

24. A method according to Claim 23, wherein said metal atom M is chosen from titanium and silicon.

25. A method according to Claim 1, wherein at least one of the following conditions are met:

-R<sub>1</sub>, which may be identical or different, is chosen from linear and branched, saturated hydrocarbon-based radicals containing 1 to 30 carbon atoms;

-R and R', which may be identical or different, are chosen from linear and branched, saturated C<sub>1-20</sub> hydrocarbon-based radicals;

-R" is chosen from -O-, -NH-, linear and branched, saturated C<sub>1-30</sub> divalent hydrocarbon-based radicals; and

-X is chosen from carboxylic acids, sulphonic acids, phosphonic acids, phosphoric acids, sulphuric acids, ketones, β-diketones, esters, β-keto esters, amines, β-keto amines, amino acids, such as α- and β-hydroxylated amino acids and derivatives thereof, α- and β-hydroxylated acids, ethers and polyethers, imines, amides, said amides being optionally hydroxylated, azo compounds, thiols, ureidos, thioether sulphoxides, thioether sulphones, optionally cyclic thioethers, di(thioethers), monoalcohols and polyols, dextrin and its derivatives, thiazolidines; hydrocarbon-based polymers and derivatives thereof.

26. A method according to Claim 25, wherein R<sub>1</sub>, which may be identical or different, is chosen from linear and branched, saturated hydrocarbon-based radicals containing 1 to 6 carbon atoms.

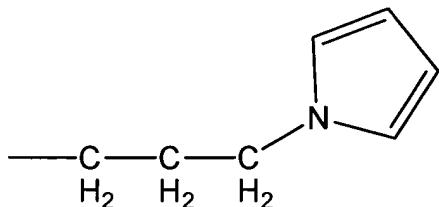
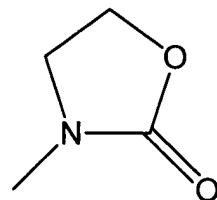
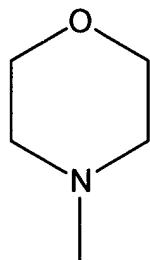
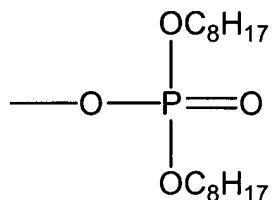
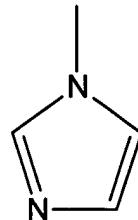
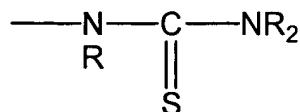
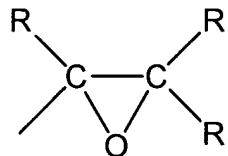
27. A method according to Claim 26, wherein R<sub>1</sub>, which may be identical or different, is chosen from a methyl radical, an ethyl radical, a propyl radical, an n-butyl radical, an isobutyl radical, and a t-butyl radical.

28. A method according to Claim 25, wherein R and R', which may be identical or different, are chosen from linear and branched, saturated C<sub>1-6</sub> hydrocarbon-based radicals.

29. A method according to Claim 25, wherein R and R', which may be identical or different, are substituted with at least one substituent chosen from a halogen atom, -NH<sub>2</sub>,

-O-NH<sub>2</sub>, -SH, -CO<sub>2</sub>H, -COR, -OH, -N=C=O, -NH-CO-NH<sub>2</sub>, -N<sup>+</sup>R<sub>3</sub>, -S<sup>+</sup>=C (NH<sub>2</sub>)<sub>2</sub>;

benzenesulphonate,



wherein R, which may be identical or different, are chosen from hydrogen and linear, branched and cyclic, saturated and unsaturated, C<sub>1-30</sub> hydrocarbon-based radicals.

30. A method according to Claim 29, wherein said halogen atom is perfluorinated.

31. A method according to Claim 29, wherein said substituent is chosen from -N<sup>+</sup>Bu<sub>3</sub>.

32. A method according to claim 29, wherein R, which may be identical or different, are chosen from linear, branched and cyclic, saturated and unsaturated, C<sub>2-20</sub> hydrocarbon-based radicals.

33. A method according to Claim 25, wherein R" is chosen from linear and branched, saturated C<sub>2-20</sub> divalent hydrocarbon-based radicals, optionally interrupted with at least one hetero atom chosen from O, N, P and S.

34. A method according to Claim 25, wherein said hydrocarbon-based polymers comprise hetero atoms chosen from N, O, S and P.

35. A method according to Claim 25, wherein said hydrocarbon-based polymers are obtained by free-radical polymerization, by condensation or by controlled "living" polymerization, wherein said polymers have a weight-average molecular weight ranging from 90 to 10,000.

36. A method according to Claim 35, wherein said hydrocarbon-based polymers have a weight-average molecular weight ranging from 100 to 1,000.

37. A method according to Claim 36, wherein said hydrocarbon-based polymers have a weight-average molecular weight ranging from 150 to 500.

38. A method according to Claim 1, wherein said at least one metallic precursor is chosen from:

- tetramethoxsilane, silicon tetraethoxide, titanium tetraethoxide, tin tetraethoxide; titanium tetraisopropoxide, silicon tetraisopropoxide, tin tetraisopropoxide; tin tetrabutoxide, titanium tetrabutoxide, silicon tetrabutoxide;

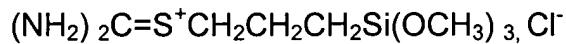
- methyltriethoxsilane, methyltrimethoxsilane, mercaptopropyltriethoxysilane, 3-aminopropyl-triethoxysilane; allyltriethoxysilane;

- N-triethoxysilylpropyl -N, N, N-tri-n-butylammonium chloride of formula (C<sub>4</sub>H<sub>9</sub>)<sub>3</sub>N<sup>+</sup>CH<sub>2</sub>CH<sub>2</sub>CH<sub>2</sub>Si (OC<sub>2</sub>H<sub>5</sub>)<sub>3</sub>, Cl<sup>-</sup>

- N-triethoxysilylpropyl-N, N, N-tri-n-butylammonium bromide of formula



- N- (trimethoxysilylpropyl) isothiouronium chloride of formula



- (3-glycidyloxypropyl) trimethoxysilane;

- (3-(2-aminoethylamino) propyl) trimethoxysilane;

- (3-(2-(2-aminoethylamino) ethylamino) propyl) trimethoxysilane;

- (4-aminobutyl) triethoxysilane;

- (N- (6-aminohexyl) aminopropyl) trimethoxysilane;

- (N-methylaminopropyl) trimethoxysilane;

- acetoxyethyltriethoxysilane;

- 3-triethoxysilylpropylurea;

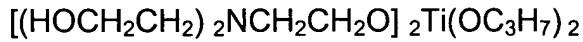
- triethoxysilane

- (3-aminopropyl) methyldiethoxysilane;

- (mercaptomethyl) methyldiethoxysilane;

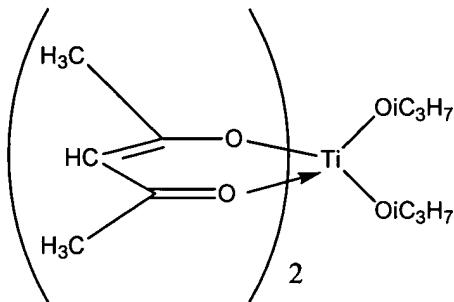
- (3-mercaptopropyl) methyldimethoxysilane;

- titanium diisopropoxide bis (triethanolamine) of formula



- methyldiethoxysilane, methyldimethoxysilane, allyldimethoxysilane;

- titanium diisopropoxide bis (2, 4-pentanedionate) of formula:



- zirconium diisopropoxide bis (2, 2, 6, 6-tetramethyl-3, 5-heptanedionate); and
- bis (2, 4-pentanedionato) titanium-O, O' - bis (oxyethyl) aminopropyltriethoxysilane.

39. A method according to Claim 1, wherein said composition comprises a sol of said at least one organometallic compound.

40. A method according to claim 39, wherein said composition comprises 1% to 100% by weight of said organometallic compound sol.

41. A method according to Claim 39, wherein said composition comprises 1.5% to 95% by weight of said organometallic compound sol.

42. A method according to Claim 39, wherein said composition comprises 10% to 90% by weight of said organometallic compound sol.

43. A method according to Claim 39, wherein said composition comprises 12% to 50% by weight of said organometallic compound sol.

44. A method of protecting and/or strengthening a keratin material comprising applying to said keratin material an effective amount of a composition comprising at least one organometallic compound.

45. A composition in the form of a make-up composition, a nail varnish, a varnish base, a nail-care product or a hair-care product, said composition comprising at least one organometallic compound obtained from at least one metallic precursor chosen from:

(a) at least one metal alkoxide chosen from formulae (Ia), (Ib), (Ic), and (Id) below:

$M-(OR_1)_n$	(Ia)
$R-M-(OR_1)_{n-1}$	(Ib)
$(R_1O)_{n-1}-M-R''-M-(OR_1)_{n-1}$	(Ic)
$RR'-M-(OR_1)_{n-2}$	(Id)

wherein:

- M and M', which may be identical or different, denote a metal atom chosen from the transition metals of groups Ib to VIIb of the Periodic Table, group VIII of the Periodic Table, the lanthanide group of the Periodic Table, aluminum, silicon, boron, tin, magnesium, alkali metals and alkaline-earth metals;
- n denotes the valency of the metal;
- $R_1$ , which may be identical or different, is chosen from linear and branched, saturated and unsaturated hydrocarbon-based radicals containing 1 to 30 carbon atoms,
- R and R', which may be identical or different, are chosen from hydrogen, linear, branched and cyclic, saturated and unsaturated,  $C_{1-30}$  hydrocarbon-based radicals, and a cosmetically active group; and
- $R''$  is chosen from  $-O-$ ,  $-NR^2-$ ,  $-S-$ , linear, cyclic and branched, saturated and unsaturated,  $C_{1-30}$  divalent hydrocarbon-based radicals, and a cosmetically active group, wherein  $R^2$  is chosen from linear, cyclic and branched, saturated and unsaturated  $C_{1-30}$  hydrocarbon-based radicals;

(b) at least one complex chosen from formulae (IIa), (IIb), (IIc) and (IId) below:

$M - (OR_1)_{n-x} (X)_x$	(IIa)
$R-M (OR_1)_{n-1-x} (X)_x$	(IIb)
$(X)_x (R_1O)_{n-1-x} M-R''-M' - (OR_1)_{n-1-x} (X)_x$	(IIc)
$RR' -M- (OR_1)_{n-x-2} (X)_x$	(IId)

wherein:

- $M, M', n, R, R', R''$  and  $R_1$  have the same meaning as above;
- $X$  is a ligand comprising an atom chosen from nitrogen, phosphorus, sulphur and oxygen;
- and
- $x$  is the number of atoms which may link to the central metal atom;

(c) at least one metal halide chosen from formulae (IIIa), (IIIb), (IIIc) and (IId) below:

$M - (Z)_n$	(IIIa)
$R-M - (Z)_{n-1}$	(IIIb)
$(Z)_{n-1}-M-R''-M'-(Z)_{n-1}$	(IIIc)
$RR' -M- (Z)_{n-2}$	(IId)

wherein:

- $M, M', n, R, R'$  and  $R''$  have the same meaning as above; and
- $Z$ , which may be identical or different, is chosen from a halogen atom; and

(d) at least one complexes chosen from formulae (IVa), (IVb), (IVc) and (IVd) below:

$M - (Z)_{n-x} (X)_x$	(IVa)
$R-M (Z)_{n-1-x} (X)_x$	(IVb)
$(X)_x (Z)_{n-1-x} M-R''-M' - (Z)_{n-1-x} (X)_x$	(IVc)
$RR' -M- (Z)_{n-x-2} (X)_x$	(IVd)

wherein:

- $M, M', n, R, R', R'', X, x$  and  $Z$  have the same meaning as above; and

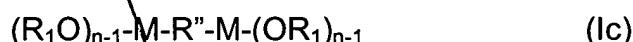
wherein said cosmetically active group is chosen from a colorant group; a photochromic group; a group for screening out UV-A and/or UV-B radiation; a group for promoting adhesion to keratin materials, such as an amide, urethane, urea, hydroxyl, carboxyl, amino acid or polypeptide group; a group which facilitates make-up removal; a bacterial or bacteriostatic group; a chelating group, for example, one which can complex multivalent cations; a hydroxy acid; a group for preventing hair loss; an antioxidant group; a free-radical-scavenging group; and a vitamin-bearing group.

46. The composition according to Claim 46, wherein said make-up composition is chosen from a mascara and a treating mascara.

47. The composition according to Claim 46, wherein said hair-care product is chosen from a styling lacquer, a lotion, a mouse, a styling spray, and a styling stick.

48. A process for treating a keratin material which comprises applying to said keratin material a composition comprising at least one organometallic compound obtained from at least one metallic precursor chosen from:

(a) at least one metal alkoxide chosen from formulae (la), (lb), (lc), and (ld) below:



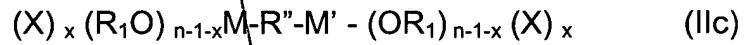
wherein:

- M and M', which may be identical or different, denote a metal atom chosen from the transition metals of groups Ib to VIIb of the Periodic Table, group VIII of the Periodic Table,

the lanthanide group of the Periodic Table, aluminum, silicon, boron, tin, magnesium, alkali metals and alkaline-earth metals;

- n denotes the valency of the metal;
- $R_1$ , which may be identical or different, is chosen from linear and branched, saturated and unsaturated hydrocarbon-based radicals containing 1 to 30 carbon atoms,
- R and R', which may be identical or different, are chosen from hydrogen, linear, branched and cyclic, saturated and unsaturated,  $C_{1-30}$  hydrocarbon-based radicals, and a cosmetically active group; and
- $R''$  is chosen from -O-, -NR<sup>2</sup>-, -S-, linear, cyclic and branched, saturated and unsaturated,  $C_{1-30}$  divalent hydrocarbon-based radicals, and a cosmetically active group, wherein R<sup>2</sup> is chosen from linear, cyclic and branched, saturated and unsaturated  $C_{1-30}$  hydrocarbon-based radicals;

(b) at least one complex chosen from formulae (IIa), (IIb), (IIc) and (IId) below:



wherein:

- M, M', n, R, R', R'' and  $R_1$  have the same meaning as above;
- X is a ligand comprising an atom chosen from nitrogen, phosphorus, sulphur and oxygen; and
- x is the number of atoms which may link to the central metal atom;

(c) at least one metal halide chosen from formulae (IIIa), (IIIb), (IIIc) and (IIIId) below:



R-M- (Z) <sub>n-1</sub>  
 (Z) <sub>n-1</sub>-M-R"-M'- (Z) <sub>n-1</sub>  
 RR' -M- (Z) <sub>n-2</sub>

(IIIb)  
 (IIIc)  
 (IIId)

wherein:

- M, M', n, R, R' and R" have the same meaning as above; and
- Z, which may be identical or different, is chosen from a halogen atom; and

(d) at least one complexes chosen from formulae (IVa), (IVb), (IVc) and (IVd) below:

M- (Z) <sub>n-x</sub> (X) <sub>x</sub> (IVa)  
 R-M (Z) <sub>n-1-x</sub> (X) <sub>x</sub> (IVb)  
 (X) <sub>x</sub> (Z) <sub>n-1-x</sub> M-R"-M' - (Z) <sub>n-1-x</sub> (X) <sub>x</sub> (IVc)  
 RR' -M- (Z) <sub>n-x-2</sub> (X) <sub>x</sub> (IVd)

wherein:

- M, M', n, R, R', R", X, x and Z have the same meaning as above; and

wherein said cosmetically active group is chosen from a colorant group; a photochromic group; a group for screening out UV-A and/or UV-B radiation; a group for promoting adhesion to keratin materials, such as an amide, urethane, urea, hydroxyl, carboxyl, amino acid or polypeptide group; a group which facilitates make-up removal; a bacterial or bacteriostatic group; a chelating group, for example, one which can complex multivalent cations; a hydroxy acid; a group for preventing hair loss; an antioxidant group; a free-radical-scavenging group; and a vitamin-bearing group.

49. A process according to Claim 49, wherein said treating comprises protecting and/or strengthening said keratin material.